# C8051F320

## USB, 25 MIPS, 16 kB Flash, 10-Bit ADC, 32-Pin Mixed-Signal MCU

### Analog Peripherals

**10-Bit ADC**

- ±1 LSB INL; no missing codes
- Programmable throughput up to 200 ksps
- Up to 17 external inputs; programmable as single-ended or differential
- Built-in temperature sensor (±3 °C)

**Two Comparators**
**Internal Voltage Reference: 2.4 V**
**POR/Brown-out Detector**

### USB Function Controller

- USB specification 2.0 compliant
- Full-speed (12 Mbps) or low-speed (1.5 Mbps) operation
- Integrated clock recovery; no external crystal required for either full-speed or low-speed operation
- Supports eight flexible endpoints
- Dedicated 1 kB USB buffer memory
- Integrated transceiver; no external resistors required

### On-Chip Debug

- On-chip debug circuitry facilitates full speed, non-intrusive in-system debug (no emulator required)
- Provides breakpoints, single stepping
- Inspect/modify memory, registers, and USB memory
- Superior performance to emulation systems using ICE-chips, target pods, and sockets

### Operating Voltage: 2.7 to 5.25 V
### Temperature Range: –40 to +85 °C

### High-Speed 8051 µC Core

- Pipelined instruction architecture; executes 70% of instructions in 1 or 2 system clocks
- Up to 25 MIPS throughput with 25 MHz Clock
- Expanded interrupt handler

### Memory

- 1280 bytes data RAM
- 16 kB Flash; in-system programmable in 512-byte sectors (512 bytes are reserved)

### Digital Peripherals

- 25 port I/O; all are 5 V tolerant
- Hardware SMBus™ ($I^2C$™ compatible), SPI™, and UART serial ports available concurrently
- Programmable 16-bit counter/timer array with five capture/compare modules
- 4 general-purpose 16-bit counter/timers

### Clock Sources

- Internal oscillator: 0.25% accuracy with clock recovery enabled; supports all USB and UART modes
- External oscillator: Crystal, RC, C, or Clock
- On-chip clock multiplier for USB controller

### Voltage Regulator

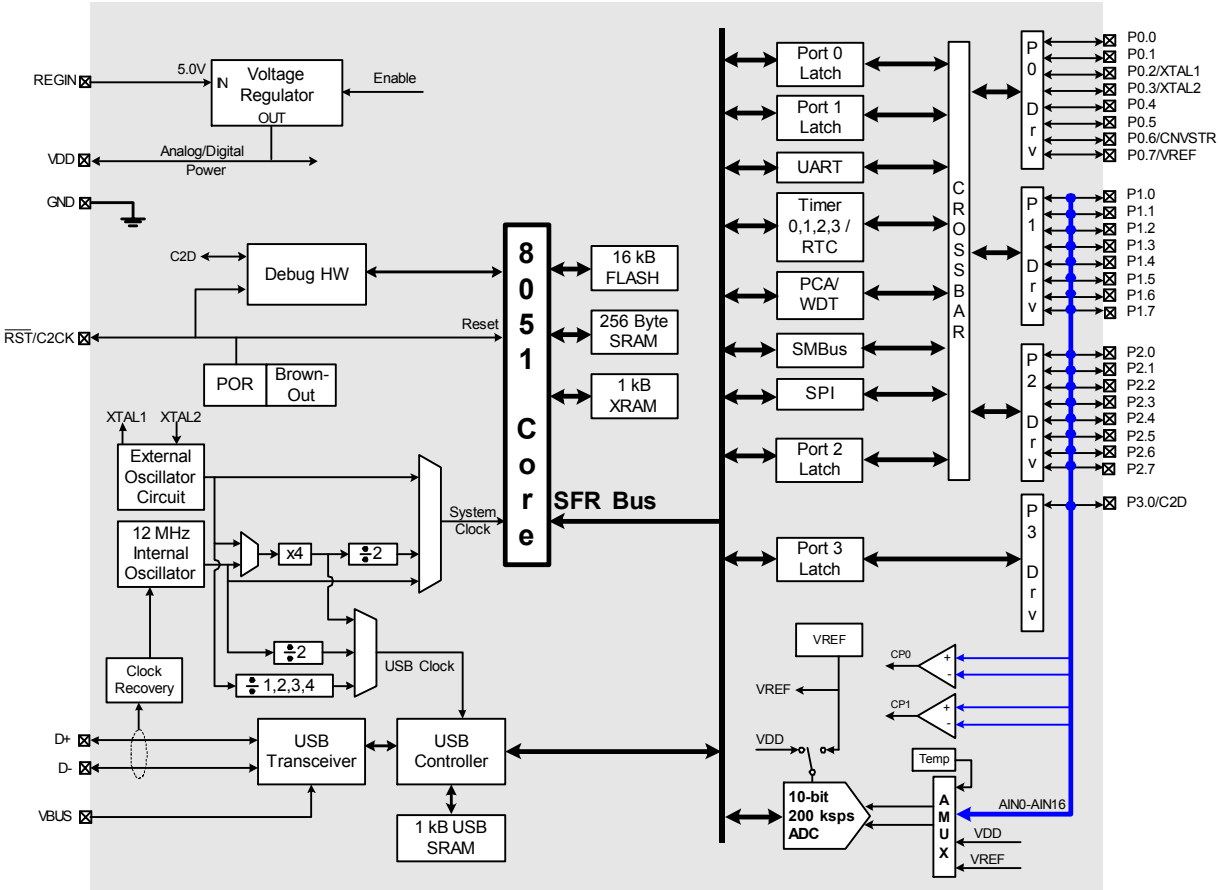
- On-chip voltage regulator supports USB bus-powered operation
- Regulator bypass mode supports USB self-powered operation

### Package

- 32-pin LQFP (lead-free package)

### Ordering Part Number

- C8051F320-GQ





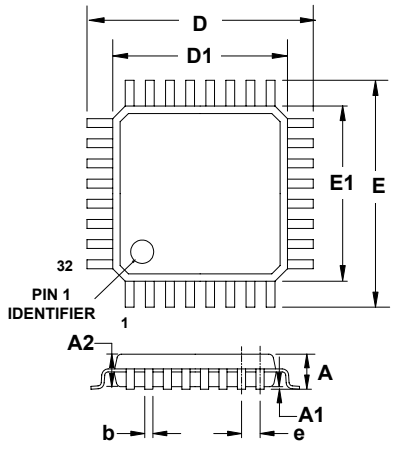
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## Selected Electrical Specifications

($T_A$ = 0 to +70 C°, VREG = 5.0 V unless otherwise specified)

| Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| **Global Characteristics** | | | | | |
| Regulator Input Voltage (REGIN) | | 4.0 | — | 5.25 | V |
| $V_{DD}$ (VREG Output) | | 3.0 | 3.3 | 3.6 | V |
| $V_{REG}$ Bias Current | $V_{REG}$ Enabled | — | 70 | — | µA |
| Supply Current with CPU and USB active | CPU Clock = 24 MHz, USB Clock = 48 MHz<br>CPU Clock = 12 MHz, USB Clock = 6 MHz | — | 18<br>9 | — | mA<br>mA |
| Supply Current (suspend mode, Oscillator off) | $V_{DD}$ Monitor Enabled; $V_{REG}$ Disabled<br>$V_{DD}$ Monitor Disabled; $V_{REG}$ Disabled | — | 30<br><0.1 | — | µA<br>µA |
| CPU System Clock Range | | DC | — | 25 | MHz |
| **Internal Oscillator & Clocks** | | | | | |
| Frequency | Clock Recovery Enabled<br>Clock Recovery Disabled | 11.97<br>11.82 | 12.0<br>12.0 | 12.03<br>12.18 | MHz<br>MHz |
| USB Clock | Full-Speed Operation<br>Low-Speed Operation | 47.88<br>5.91 | 48.0<br>6.0 | 48.12<br>6.09 | MHz<br>MHz |
| **A/D Converter** | | | | | |
| Resolution | | | 10 | | bits |
| Integral Nonlinearity | | — | ±½ | ±1 | LSB |
| Differential Nonlinearity | Guaranteed Monotonic | — | ±½ | ±1 | LSB |
| Signal-to-Noise Plus Distortion | | 53 | — | — | dB |
| Throughput Rate | | — | — | 200 | ksps |
| Input Voltage Range | | 0 | — | $V_{REF}$ | V |
| **Comparator** | | | | | |
| Response Time Mode0 | (CP+) – (CP-) = 100 mV | — | 0.1 | — | µs |
| Current Consumption Mode0 | | — | 7.6 | — | µA |
| Response Time Mode1 | (CP+) – (CP-) = 100 mV | — | 0.18 | — | µs |
| Current Consumption Mode1 | | — | 3.2 | — | µA |
| Response Time Mode2 | (CP+) – (CP-) = 100 mV | — | 0.32 | — | µs |
| Current Consumption Mode2 | | — | 1.3 | — | µA |
| Response Time Mode3 | (CP+) – (CP-) = 100 mV | — | 1 | — | µs |
| Current Consumption Mode3 | | — | 0.4 | — | µA |

## Package Information




| | MIN (mm) | NOM (mm) | MAX (mm) |
|---|---|---|---|
| A | - | - | 1.60 |
| A1 | 0.05 | - | 0.15 |
| A2 | 1.35 | 1.40 | 1.45 |
| b | 0.30 | 0.37 | 0.45 |
| D | - | 9.00 | - |
| D1 | - | 7.00 | - |
| e | - | 0.80 | - |
| E | - | 9.00 | - |
| E1 | - | 7.00 | - |

## C8051F320DK Development Kit





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